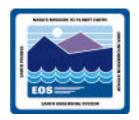


Road to AM-1 / Landsat-7 Rick Kochhar / Doug O'Neill

rkochhar@eos.hitc.com / dougo@eos.hitc.com

Day 9 - 25 April 1996

A Look Down the Road



Release B CDR to AM-1/Landsat-7 Launch

Planning Considerations



- Custom Code Development
- Test Activities
- COTS Integration Activities
- Additional Events and Activities
- Hardware Acquisition Approach
- Road and CDR Summary

Release B Highlights



Major Milestones

• Critical Design Review 4/25/96

• SDSRV/DDSRV △ Detailed Design Review 6/96

Incremental Track Detailed Design Review 9/18/96

• Test Readiness Review 3/3/97

• Consent to Ship Review 6/2/97

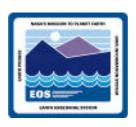
• Release Readiness Review 9/2/97

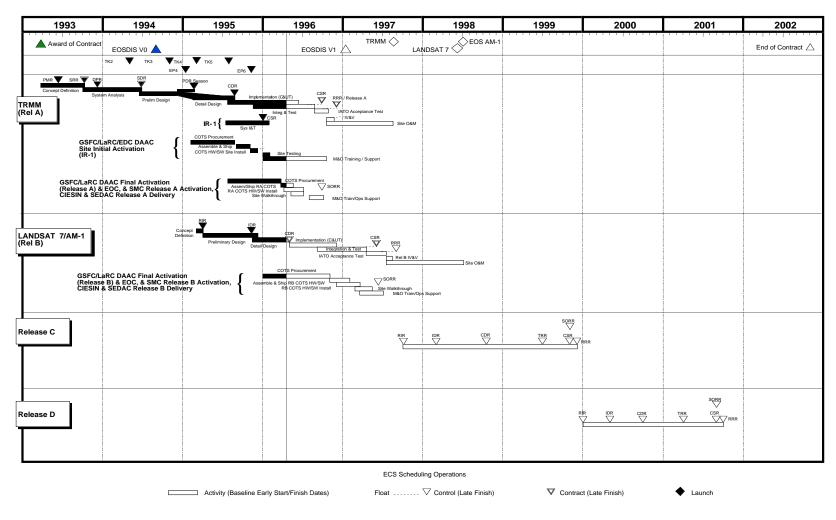
Release B Highlights



- Release A code reuse
- Regression Test of Release A functions
- Code, unit test, and integrate 21 CSCIs
- Integrate 6 new COTS packages
- Integration and Test of new Release B functionality
- Satisfy 1861 L4 requirements (excluding FOS)
- Enable Release B Operational Transition
- Install and/or upgrade new networks and capacity to support Release B sites

ECS Master Summary Schedule





Proposed Implementation Schedule



Release A Implementation

Release A I&T

Release B Detailed Design

Release B Implementation SDSRV/DDSRV Phase 1 CUT Release B I & T

EP 7 Objectives & Design EP 7 Implementation EP 7 I&T EP 7 Field Evaluation

DAAC HW/COTS Procurement DAAC Installation

Acceptance Test

M&O.1 Studies/Analysis

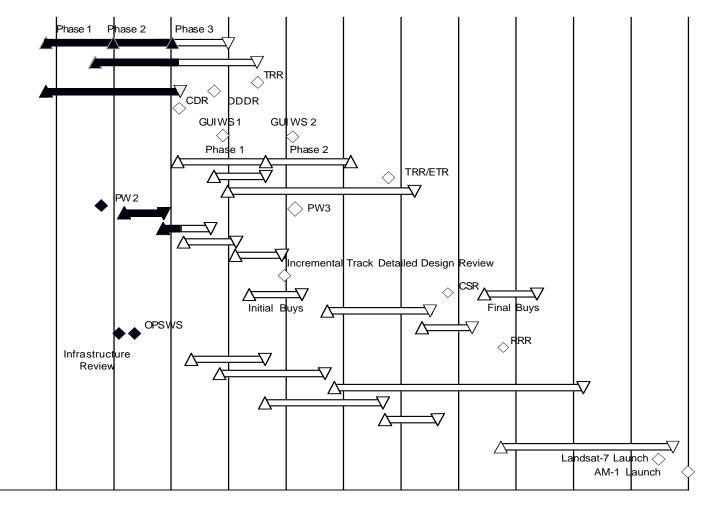
M&O.1 Code Development

M&O.1 Sustaining Engineering

M&O.1 I&T

M&O.1 Installation

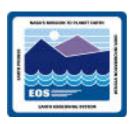
AM-1/Landsat-7 Launch Readiness



705-CD-005-001 Day 9

RK/DO-6

A Sound Technical Approach



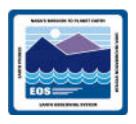
Implementation

- Started C&UT early (pre-CDR) on well understood CIs and COTS integration
- Two-phase implementation
- Synchronize with Release A at end of each Release A C&UT phase Integration and Test
- Start integration and test early
 - Similar to process in Release A
 - Increases testing lead time
 - I&T concurrently with implementation
 - Reduces schedule risk
 - Reduces serial dependency

Deployment

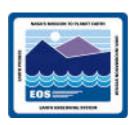
- Release M&O.1 to facilitate operational transition
- Implement advance testing at B-only sites

Implementation



- Phase 1 emphasizes implementation of public interfaces, infrastructure and key mechanisms
- Extensive interaction with Release A development staff
 - Mutual Inspection participation
 - Architects' Office coordination
 - Joint Infrastructure Teams
- Extensive interaction with Stakeholders (e.g. GUI Workshops, ITDDR)
- Heavy emphasis on testing functional threads
- Emphasize implementation of crucial functionality early
- Implementation metrics identical to Release A

Code, Unit Test and I&T Metrics



Same as Release A

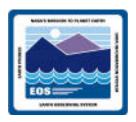
Actual vs. Planned No. of Object Classes Coded

Actual vs. Planned No. of Object Classes Unit Tested

Actual vs. Planned No. of Build Threads Completed

Actual vs. Planned No. of Test Threads Completed

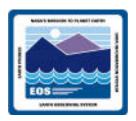
A Look Down the Road



Release B CDR to AM-1/Landsat-7 Launch

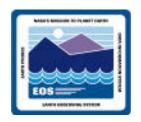
- Planning Considerations
- Custom Code Development
- Test Activities
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- Additional Events and Activities
- Hardware Acquisition Approach
- Road and CDR Summary

Custom Code Development Topics



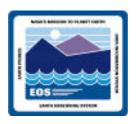
- Source Lines of Code (SLOC) Changes since IDR
- Phased implementation plan
- Client subsystem code growth
- Data Server subsystem phased implementation plan

New SLOC Estimates by Milestone



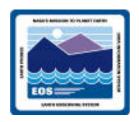
CI	IDR	CDR	Δ
Client			
Desktop (DESKT)	1,000	3,200	2,200
Workbench (WKBCH)	38,500	65,500	23,800
Web Client	-	17,000	17000
IDM			
Advertising Service (ADSRV)	2,000	2,000	•
V0 Interoperability Gateway	2,000	1,900	(100)
Data Dictionary (DDICT)	7,700	10,600	2,900
Local Information Manager (LIMGR)	12,000	12,000	-
Distributed Information Manager (DIMGR)	8,700	4,150	(4,550)
Data Server			
Science Data Server (SDSRV)	46,500	49,900	3,400
Document Data Server (DDSRV)	4,000	5,040	1,040
Storage Mgmt (STMGT)	2,500	3,150	650
Data Distribution (DDIST)	8,000	10,100	2,100
Ingest			
Ingest (INGST)	9,600	10,500	900
PDPS			
Production Planning (PLANG)	14,650	22,160	7,510
Processing (PRONG)	19,900	21,400	1,500
Algorightm I&T (AITTL)	4,900	7,500	2,600
CSS			
Distributed Computing Software CI	27,300	26,000	(1,300)
MSS			
Management Software (MCI)	24,300	23,650	(650)
Management Agents (MACI)	1,000	800	(200)
Management Logistics (MLCI)	9,000	8,100	(900)
Release B Total	243,550	301,450	57,900

Major SLOC Estimate Changes Since IDR-B



- Overall increase of 24%, increase excluding Client 7%
- Interoperability and Data Management
 - Data Dictionary (+2.9K), additional requirements for DDICT maintenance tool and improved GUI SLOC estimates
 - DIM (-4.6K), CDR design capitalized on opportunities for LIM reuse
- Data Server
 - Science Data Server (+3.4K), conversion of stored procedures from Sybase to Illustra
 - Data Distribution (+3K), refined estimate based on detailed design and experience on Release A
- Planning and Data Processing
 - Planning (+7.5K), added resource planning, responded to IDR and Ops Workshop issues on cross DAAC Planning, refined DB effort based on Release A experience
 - Algorithm I&T Tools (+2.6K), added automated PGE exit handling

Goals of Each Phase



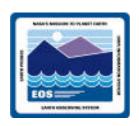
Phase I

- Develop or enhance remaining Infrastructure Components
- Emphasize new/unique Release B implementation
- Minimize dependencies on Release A Components
- Provide functional Threads for I&T
- Balance development effort between Phases
- Incremental Track: incorporate results of EP6 and PW2; develop EP7

Phase 2

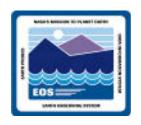
- Remaining Release B implementation
- Enhancement of Release A Components
- Balance development effort between Phases
- Incremental Track
 - Incorporate results of EP7 and PW3
 - Transition to Formal Track

Release B Functionality Phase One



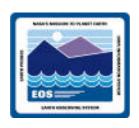
IDG	MSS	DSS	CLS	IDM	PDPS	Ingest
Object Services	S/W Distribution	Science Data Server	Release B Desktop	Data Dictionary	Production Request	Request Manage
- Directory/Naming	- LSM/SMC	- Release A Retrofit		- Searches of Valids,	Editor	Enhancements
Support for Mode	Distribution	Use of Illustra 4GL	Workbench Tools	Attributes and	- Rel B Production	- Suspend &
Management		- New Products	- Earth Science	Dependent Valids	Rules	Cancel requests
- Enhanced Security	Training Tracker	- New Services	Search	- Add, Modify &		- Granule Server
Authentication	Tool		- Data Dictionary	Delete Schema	Planning Workbench	Implementation
- API and		Distribution	- User Registration	- Add Subscription	- Create Plan	'
Extensions to Time	S/W License Admin.	- Automatic Media	- User Profile	Notification	- Plan Control	Tape Check-in
Service		Label Generation	- Comment Survey	- Support for		
	Enhanced Trouble	- Automatic	- Document Search	Complex Terms	On-Demand	HTML Screens
Common Facilities	Ticket Submission	Shipping Label	- Product Request	and Searches	Manager	Option
- File Access	Exchange TT w/Ebnet	Generation	- Timeline	- Replicated Data		·
- Terminal Access	1	- 3480/3490 Tape	- Mapping	Dictionary	Subscription	
- Bulletin Board	Customer Survey	Distribution	'' "	1	Manager	
Service	1	- Estimate Media		LIM	- Handle Subscrip-	
	Accountability	Utilization		 Inventory search, 	tion Notices	
Infrastructure	- User Profile Updates	- Large Volume		browse & Acquire		
Services	- User Registration	Request Handling		to V0 Gateway	Data Preprocessing	
- Extensions to	- User Comments			- Guide Search		
Managed Process		Storage Management			SSI&T	
Framework	Billing &	- Archive Media		DIM	- SSAP	
- Universal	Accounting	Refresh		 Inventory search 		
References	- Price Tables	 Deleting Archived 		browse, guide	PGE Execution	
 Server Request 		Files		search & acquire to	- Enter 50B1	
Framework	Report Generation	 Resource Cost 		LIM, GTWAY,	Autosys Load	
 Interoperability 	- Statistics/Trending	Estimation		SDSRV	 Late Start 	
Gateways	- HTML User	 Configuration 			- Mo	
	Interface	Parameter		Gateway		
		Reporting		 Inventory search, 	Monitoring	
	Fault Mgt	 Storage System 		browse, guide	- PGE Exit	
	- Fault correction	Performance		search, and	Handling	
	- LSM Rules	Reporting		product request to		
	1	 Storage System 		V0	Release B Database	
	Mode Mgt	Utilizaion		- Server	Schema	
	- Mode initiation	Reporting		Configuration and		
	1			setup		
	Logistics Mgt	Doc Data Server		- 2-Way V1-V0		
	- Inventory Control	- Document Insert &		Interoperability		
		Search for New				1

Release B Functionality Phase Two



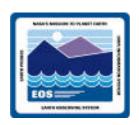
IDG	MSS	DSS	CLS	IDM	PDPS	Ingest
DOF	S/W Distribution	Science Data Server	Web Client	Data Dictionary	Planning Workbench	Request Manage
- Factories/Object	- Integration with	- New Generic		- Definition of	- Activate Plan	Enhancements
Lifecycle	Baseline Manager	Services	On-Line Help	DIM/LIM/Gateway	- Cross DAAC	- Request
	- Site S/W Install		- Training Utility	collection	Planning	Resumption &
Object Services		Distribution	- Context Sensitive	information and		Change Priority
- Authorization	ILM Management	- File Compression		mapping to DSS	Production Request	
- Data Integrity		- Correctable Error	Workbench Tools	- Advertising of	Editor	Preprocessing
- Data Privacy	Policy & Procedures	Management	- EOSVIEW	DIM/LIM/Gateway	- Create Collections	- non-AM1/L7
- Kerberos Clients		- 4mm Media	- Logger/Reviewer	services		Metadata Extract
	Backup & Restore	Distribution	- Session	- V0 Valids Ingest	Subscriptions	
Common Facilities		- FAX Distribution	Management	- Mapping from ECS	- Create Predictions	
- kftp & DFS File	Fault Management	- Estimate Shipping,	- DAR	to non-ECS Terms		
Access	- SMC Rules	Network, Archive	- Data Production	& Attributes	Resource Planning	
 ktelnet Terminal 		Storage & Media	Request		1	
Access	Accountability	Coss	- E-Mailer	LIM	DAAC QA	
- HPPI Interface	- Request tracking		- HyperText Viewer	- Generic SDSRV	- Non-Science QA	
	Tool	Storage Management	- HyperText	Service Location		
Infrastructure	- ASTER Gateway	- Archive Backup &	Authoring	- Incremental,	SSI&T	
Services	-	Restore	- News Reader	Coincident Search	- PGE	
 Subscriptions 	Billing &	- FAX Distribution		- Session Recovery,		
	Accounting	- Checksum Error		Suspend &	PGE Execution	
	 Post orders, accts 	Monitoring &		Resume	- Resource Overrun	
	receivable, bills/state-	Reporting		- Automatic	 Suspend/Resume 	
	ment report	- EDOS data		Integration of New	- DEA/Work	
		Reingest Request		Collections	Avoidance	
	Report Generation	- Providing				
	 Standard Reports 	Accounting Data to		DIM	Predictive Staging	
	- Trending Analysis	MSS		- Generic Service		
	Reports			Invocation to LIM	Production Subsetting	
		Doc Data Server		and SDSRV		
	Agent Services	- Document		- Automatic	Inter-DAAC Insert	
	- Suspend & Resume	Subscription		Federation of New		
		Service		Collections		
	Mode Management	- Document				
	- Mode Monitor &	Administration		Gateway		
	Control	- System		 Session Recovery, 		
		Management		Suspend &		
	Mgt Data Access	Support		Resume		
	- Mode Specific Data					
	Logging					
	 Error/Event Chaining 					

New SLOC Estimates by Phase



Subsystem	Phase 1	Phase 2	Total
Data Server (DDIST/STMGT)	7,970	5,280	13,250
Data Server (DSS-SDSRV)	19,960	29,940	49,900
Data Server (DDSRV)	1,000	4,040	5,040
Ingest (INS)	5,000	5,500	10,500
Planning (PLS)	12,770	9,390	22,160
Data Processing (DPS)	14,600	14,300	28,900
Client (CLS)	34,700	47,800	82,500
Interoperability (IOS)	2,000	1,900	3,900
Data Management (DMS)	15,900	10,850	26,750
Management (MSS)	13,250	19,300	32,550
Communication (CSS)	13,500	12,500	26,000
Total	140,650	160,800	301,450

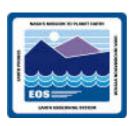
Schedule (in Calendar Months) Feasibility by Phase for Code and Unit Test



Subsystem	Phase 1	Phase 2
Data Server (DSS - DDIST/STMGT)	2.0	1.7
Data Server (DSS - SDSRV)	2.9	3.4
Data Server (DSS - DDSRV)	0.9	1.6
Ingest (INS)	1.7	1.8
Planning (PLS)	2.5	2.2
Data Processing (DPS)	2.6	2.6
Client (CLS)	3.6	4.1
Interoperability (IOS)	1.2	1.2
Data Management	2.7	2.3
Management	2.5	2.9
Communications (CSS)	2.5	2.4
Phase Duration	4.0	4.0

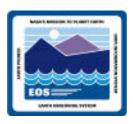
Durations computed for optimal staff using REVIC Model

Client Subsystem Code Growth



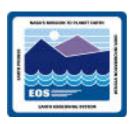
- Client code growth since IDR
 - Desktop (+2.2K), Web Client (+17K), Workbench Tools (+23.8K)
 - Includes EP7 and final Release B development
- Factors contributing to SLOC estimate increase
 - Improved estimates based on actuals from Incremental Track
 - Incorporation of actual SLOC from GUI Development Tools and Libraries (10-20K in GUI Tool generated code)
 - Replacing CHUI Client with basic Web Client
 - Requirements or expectation creep
 - » Due to complexity based on requirements and iteration with users (e.g. ASTER DAR tool)

Client Code Growth Impacts



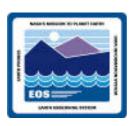
- Schedule Risk Feasibility
 - Early start due to Incremental Track
 Phase 1 Development including EP-7 March August
 Phase 2 Development August December
 - Higher productivity from use of GUI Development Tools and COTS Libraries
 - Workbench Tools can be developed in parallel
- Cost Mitigation
 - Requirements, Design and Implementation Plans to be re-evaluated
 - » Internal evaluation underway to re-assess sizing and scope of Client for EP-7 and Release B
 - » ESDIS/ECS Working Group to address streamlining of Release B Client, focus on needs versus desires; results to be presented at ITDDR

DSS & Component Status



- Two DSS CSCIs, STMGT and DDIST fully designed
- All DSS public interfaces: design completed and stable
 - Interfaces used among DSS CIs
 - Interfaces used by other CIs to access DSS services
- All public interfaces under configuration control at CDR-B, just as for Release A at CDR-A
 - Includes public interfaces for SDSRV and DDSRV
- Two SDSRV and DDSRV, have not completed detailed design
 - Delta Detail Design Review scheduled early June
 - Phase 1 of implementation ~3 months

Data Server Phased Recovery Plan



- Schedule Recovery
 - SDSRV Implementation Plan focuses on providing a functional Release B Science Data Server in Phase 1 and adds additional products and services in Phase 2

Phase 1 (3 months)

Conversion from Release A SDSRV (Sybase based) to Release B SDSRV (Illustra based)

Implement selected new products and services (ESDTs)

Phase 2 (4 months)

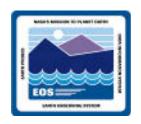
Complete implementation of new products and services (ESDTs)

 Implementation within the phases can be further distributed into highly parallel implementation tasks

Incremental deliveries can be made to I&T in Phase 2

 SDSRV & DDSRV will be on same phased schedule with other CIs by the end of Phase 1

SDSRV Schedule Feasibility by Phase



Based on Parallel Implementation Activities

	Phase 1		Phase 2	
	SLOC	Duration	SLOC	Duration
Release A Retrofits	10,500	2.3		
Use of Illustra 4GL	3,400	1.5		
Release B New Generic Services	4,060	1.6	15,940	2.7
Release B New Products	2,000	1.2	14,000	2.5

A Look Down the Road



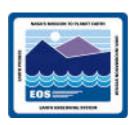
Release B CDR to AM-1/Landsat-7 Launch

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- Custom Code Development
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- COTS Integration Activities
- Additional Events and Activities
- Hardware Acquisition Approach
- Road and CDR Summary

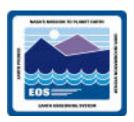
Release B Integration and System Test



No documents due for CDR

- Follows same process as Release A I&T
 - Incremental integration of Units into functional threads and builds
 - Verifies L3/L4 Functional and Performance Requirements
 - Documented in DID 322/414 I&T Procedures
 - Problems documented by formal NCRs
 - » NCRs controlled by Release B CCB (or designated sub-board)
 - EDF Test Environment controlled by EDF CCB
 - ECS developed S/W under CMO control in the Software Development Library (SDL)

Release B Acceptance Testing



Acceptance Testing is the final development contractor test activity

Verifies functionality and performance of ECS Release B at the sites against the Level 3 requirements.

- Led by the ECS Independent Acceptance Test Organization (IATO)
- Details of the Acceptance Test Process are documented in the Acceptance Test Management Plan (DID 415) submitted at SDR (available on EDHS)

Schedule

- Site testing starts June 1997 with CSR
- Finishes September 1997 with RRR

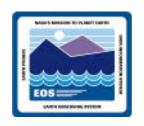
Science Software I&T



Performed after RRR

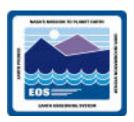
- Test the Production Readiness of the Science Software
 - Reliability (runs to normal completion repeatedly over normal range of data inputs and run-time conditions)
 - Safety (executes without interfering with other S/W or DAAC operations)
- Demonstrate Portability of Science Software
 - Adherence to standards
 - Use of SDP Toolkit
- Determine Production Resource Requirements
 - -(e.g., CPU time, I/O, RAM, temporary storage)
- Test Interfaces
 - -SCF → DAAC Interfaces (e.g., Log Files, QA Data)

Science Software Deliveries for AM-1 Release



Instrument	SSI&T DAAC Site	Delivery Date
ASTER	EDC	May-98
CERES	LaRC	August-97
MISR	LaRC	December-97
MODIS	EDC, GSFC, NSIDC	November-97
MOPPIT	LaRC	December-97
SAGE III	LaRC	March-98
SeaWinds	JPL	September-98
DFA/MR	JPL	March-00
ACRIM	GSFC	February-98

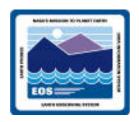
A Look Down the Road



Release B CDR to AM-1/Landsat-7 Launch

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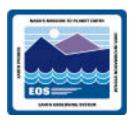
COTS Integration Strategies



Release B is inheriting 77% of its COTS products from Release A

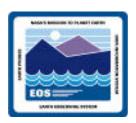
- Prototypes and studies
- Extensive testing/advance use
- Advance integration/implementation
- Delayed procurement when technology warrants
- Leverage training opportunities
- Cross release coordination; leverage Release A knowledge
- Increased by only 6 COTS products in Release B
- Maximize vendor support

COTS Procurement Status



- SDSRV: ORDBMS Illustra
- Report Generator: selection submitted for approval
- Performance Trending: selection submitted for approval
- Inventory, Logistics, Maintenance: selection submitted for approval
- Billing and Accounting: selection submitted for approval
- Web Server: Delayed until 9/96 to leverage rapidly advancing technology

A Look Down the Road



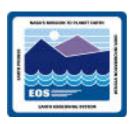
Release B CDR to AM-1/Landsat-7 Launch

- Planning Considerations
- Custom Code Development
- Test Activities
- COTS Integration Activities
- Additional Events and Activities



Road and CDR Summary

GUI Development Process



Operational Screens

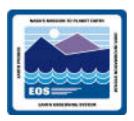
Stage I - Detailed Workflow Analysis (completed)

- DAAC Community approved scenarios (reviewed in detail at Release B Ops Workshop, Jan '96)
- Analysis included detailed operations workflows and data activity tables
- Detailed Workflow Analysis completed and documented in DID 605

Stage II - GUI Development Workshops

- ECS to host two workshops to solicit timely feedback from DAAC community
 - Review GUI screen design and operability
 - Initial workshop mid-June; second one mid-October
- Process very successful in Release A

GUI Development Schedule Incremental Track

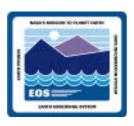


• PW2 Completed: 1/26/96

• EP-7 TRR: 5/15/96

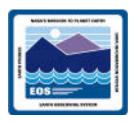
- CLS migration to Formal Track begins 6/96; includes baselined input from:
 - **-PW2**
 - **-EP7**
 - **-PW3**
 - other prototypes

Incremental Track Component Transition



- Part of Release B functionality delivered by components developed on Incremental Track
- Required components of EPs and Prototypes included
- Incremental Track software transitioning to Formal Track: documented and standardized to conform to formal track software
- Incremental Track Detailed Design Review
 - Will provide opportunity to evaluate detailed design of Incremental Track subsystems prior to formal transition
 - Marks transition of incremental development to formal track for Release B
 - Client, Interoperability and Data Management Subsystem detailed design
 - Includes formal documentation

Release B Functionality for the SDP Toolkit



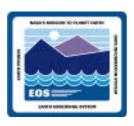
Planned Enhancements

- Improved efficiency
- Support for PDPS handling of unusual PGE events
- HDF interface improvements based on user feedback to Version 1 release

Candidate Enhancements

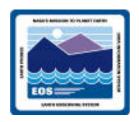
- Parallel processing support
- User requested geolocation enhancements
- Enhanced product filenaming capability
- Support additional LO data formats

Transition Approach



- Release M&O.1 to install Release B environment (operating systems, DCE version and topology) into Release A
- Include mode management capability in M&O.1 Release
 - Facilitates concurrent B testing and A operations
- Schedule IATO to Release B-only sites (ORNL, NSIDC, JPL, ASF) before Release A sites
 - To be confirmed with the individual DAACs

A Look Down the Road

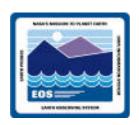


Release B CDR to AM-1/Landsat-7 Launch

- Planning Considerations
- Custom Code Development
- Test Activities
- COTS Integration Activities
- Additional Events and Activities
- Hardware Acquisition Approach



Revised Phasing of At-Launch Hardware Capacity



Objective:

• Reduce uncertainties regarding algorithm resource needs (e.g., RAM); take advantage of future price drops; reduce maintenance term

Approach:

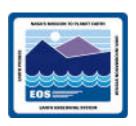
- Test performance by developing science benchmark to measure processor and I/O capacity
- Initial configuration planned to simplify later installations, e.g., with all expected hosts, so only CPU boards, RAM, and disks would be added later
- At least one fully configured system (all expected CPUs, RAM, and disks at each DAAC) to enable scalability testing in DPS
- At lease one fully populated silo (all read/write heads) delivered and tested for DSS
- Applies to large DAACs only (GSFC, EDC and LaRC)
- Initial delivery per original schedule: Dec Apr '97
- Final delivery completed 3 months prior to AM-1 launch

Hardware Phasing: Schedule



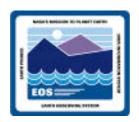
•	Issue AM-1 "Initial Buy" P.O.s	14 Aug '96
•	Complete Release B "Initial Buy" Installations	Dec '96 - Apr '97
•	Release B RRR	1 Sep '97
•	Issue AM-1 "Final" P.O.s for at-launch capacity and TRMM launch + 1 capacity	30 Oct '97
•	Complete "At Launch" Installation and burn-in	Jan - Mar '98
•	Landsat-7 Launch	31 May '98
•	AM-1 Launch	30 Jun '98
•	Issue P.O.s for AM-1 launch + 1 capacity	30 Oct '98
•	Complete "Launch +1" installation and burn-in	Jan - Mar '99
•	Issue P.O.s for AM-1 launch + 2 capacity	30 Oct '99
•	Complete "Launch +2" installation and burn-in	Jan - Mar '00

Release B CDR to AM-1/Landsat-7 Launch



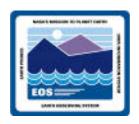
- Detailed Planning and Schedule
 - Planning Considerations
 - Custom Code Development
 - Test Activities
 - COTS Integration Activities
 - Special Topics
 - Operational Transition Methodology
 - Hardware Acquisition Approach
 - − Road and CDR Summary

CDR: Completion of ECS Release B Design Phase



- Implementation Feasibility
 - Schedule for ECS Release B is feasible
 - Phased code drops and concurrent integration and test activities maximize delivered code quality
 - COTS integration issues addressed through evaluation, prototyping, and advance implementation
 - SDSRV/DDSRV plan recovers float and integrates with other Release B components for on schedule delivery
 - Incremental track schedule integrates key items into Release B; allows appropriate review and comment
 - Operational readiness activities understood and on schedule
 - Release B operational transition plan minimizes impact on sites
 - Release B hardware acquisition phased for maximum effectiveness
 - Risks understood and mitigated

ECS Release B Design



- Ready to Implement
- Schedule feasible
- Risks understood and mitigated